

**IN THE CLAIMS**

Please cancel claims 21 and 22 without prejudice or disclaimer, and amend claims 10, 12, 20, 50, 55, 59, 66 and 76, as follows:

1           Claims 1-6. (Canceled)

1           7. (Previously Presented) A cathode for an electron tube, comprising:

2           a metal base; and

3           an electron-emitting material layer coated on the metal base, said electron-emitting  
4           material layer comprising a needle-shaped conductive material;

5           said needle-shaped conductive material being at least one material selected from a  
6           group consisting essentially of carbon, indium tin oxide, nickel, magnesium, rhenium,  
7           molybdenum and platinum;

8           said needle-shaped conductive material being a carbonaceous material, said needle-  
9           shaped conductive material being in a range of 0.01 to 30% by weight based on a total weight  
10          of said electron-emitting material layer, and a thickness of said electron-emitting material  
11          layer being in a range of 30 to 80  $\mu\text{m}$ .

          Claims 8-9. (Canceled)

1           10. (Currently Amended) A cathode for an electron tube, comprising:

2 a metal base; and

3 an electron-emitting material layer coated on the metal base, said electron-emitting  
4 material layer comprising a needle-shaped conductive material and having a surface  
5 roughness, corresponding to a distance between a highest point and a lowest point on a  
6 surface of the electron-emitting material layer, ~~[[being]]~~ which is less than 10 microns;

7 wherein said needle-shaped conductive material in the electron-emitting material  
8 layer is in a range of 0.01 to 30% by weight based on a total weight of said electron-emitting  
9 material.

Claim 11. (Canceled)

1 12. (Currently Amended) A cathode for an electron tube, comprising:

2 a metal base; and

3 an electron-emitting material layer coated on the metal base, said electron-emitting  
4 material layer comprising a needle-shaped conductive material;

5 said needle-shaped conductive material being at least one material selected from a  
6 group consisting ~~essentially of indium tin oxide~~, nickel, ~~magnesium~~, rhenium, molybdenum  
7 and platinum.

Claims 13-19. (Canceled)

1           20. (Currently Amended) A cathode for an electron tube, comprising:

2           a metal base;

3           an electron-emitting material layer coated on the metal base, said electron-emitting  
4 material layer comprising a needle-shaped conductive material and having a surface  
5 roughness, corresponding to a distance between a highest point and a lowest point on a  
6 surface of the electron-emitting material layer, ~~[[being]]~~ which is less than 10 microns; and

7           a metal layer including nickel grains having sizes smaller than sizes of grains in said  
8 metal base, said metal layer being formed between said metal base and said electron-emitting  
9 material layer;

10           said metal layer further including at least one metal selected from a group consisting  
11 of aluminum (Al), tantalum (Ta), chromium (Cr), magnesium (Mg), silicon (Si) and  
12 zirconium (Zr).

Claims 21-28. (Canceled)

1           29. (Previously Presented) An oxide cathode for an electron tube, comprising:

2           a metal base; and

3           an electron-emitting material layer coated on the metal base, said electron-emitting  
4 material layer comprising a needle-shaped conductive material;

5           said needle-shaped conductive material being at least one material selected from a  
6 group consisting essentially of carbon, indium tin oxide, nickel, magnesium, rhenium,

molybdenum and platinum;

said needle-shaped conductive material being a carbonaceous material, said needle-shaped conductive material being in a range of 0.01 to 30% by weight based on a total weight of said electron-emitting material layer, and a thickness of said electron-emitting material layer being in a range of 30 to 80  $\mu\text{m}$ .

Claims 30-47. (Canceled)

48. (Previously Presented) A cathode, comprising:

a metal base;

layer means disposed upon said metal base for emitting electrons; and

additional means for providing electrically conducting paths through said layer means for emitting electrons, said additional means comprising a needle-shaped electrically conductive material having a specific resistance not greater than  $10^{-1}$  ohms centimeter, and comprising 0.01% by weight to 30% by weight of said layer means.

49. (Previously Presented) The cathode of claim 48, further comprising a metal layer exhibiting a grain size smaller than said metal base and interposed between said metal base and said layer means.

50. (Currently Amended) The cathode of claim 48, said needle-shaped conductive

material being selected from a group consisting ~~essentially of carbon, indium tin oxide,~~  
nickel, ~~magnesium,~~ rhenium, molybdenum and platinum.

51. (Previously Presented) A cathode, comprising:

a metal base;

a layer of electron-emitting material disposed upon said base; and

a needle-shaped electrically conductive material providing electrically conductive  
paths disposed throughout said layer of electron-emitting material;

said needle-shaped electrically conductive material having a specific resistance not  
greater than  $10^{-1}$  ohms centimeter.

52. (Previously Presented) The cathode of claim 51, further comprising a metal layer  
exhibiting a grain size smaller than said metal base and interposed between said metal base  
and said layer of electron-emitting material.

53. (Previously Presented) The cathode of claim 51, said conductive material  
comprising 0.01% by weight to 30% by weight of said layer of electron-emitting material.

Claim 54. (Canceled)

55. (Currently Amended) The cathode of claim 51, said layer of electron-emitting

2 material having a surface roughness<sub>1</sub> corresponding to a distance between a highest point and  
3 a lowest point on a surface of the electron-emitting material<sub>1</sub> ~~[[being]]~~ which is less than 10  
4 microns.

Claim 56. (Canceled)

1 57. (Previously Presented) A cathode, comprising:  
2 a metal base; and  
3 a layer disposed upon said metal base;  
4 said layer comprising an electron-emitting material, and a needle-shaped electrically  
5 conductive material disposed within said layer and having a specific resistance less than a  
6 specific resistance of said electron-emitting material.

1 58. (Previously Presented) The cathode of claim 57, said needle-shaped electrically  
2 conductive material providing electrically conductive paths in said layer.

1 59. (Currently Amended) The cathode of claim 57, said layer having a surface  
2 roughness<sub>2</sub> corresponding to a distance between a highest point and a lowest point on a  
3 surface of the electron-emitting material<sub>1</sub> ~~[[being]]~~ which is less than 10 microns.

1 60. (Previously Presented) The cathode of claim 57, said conductive material having

2 a specific resistance not greater than  $10^{-1}$  ohms centimeter.

1 61. (Previously Presented) The cathode of claim 57, said layer having a thickness in  
2 a range of 30 microns to 80 microns.

1 62. (Previously Presented) The cathode of claim 57, said conductive material  
2 comprising 0.01% by weight to 30% by weight of said layer.

1 63. (Previously Presented) A cathode, comprising:  
2 a metal base; and  
3 a layer disposed upon said base;  
4 said layer comprising an electron-emitting material, and a needle-shaped electrically  
5 conductive material having a specific resistance not greater than  $10^{-1}$  ohms centimeter.

1 64. (Previously Presented) The cathode of claim 63, further comprising a metal layer  
2 having a grain size smaller than a grain size of said metal base, and interposed between said  
3 metal base and said layer.

1 65. (Previously Presented) The cathode of claim 63, said conductive material  
2 comprising 0.01% by weight to 30% by weight of said layer.

1           66. (Currently Amended) The cathode of claim 63, said layer having a surface  
2 roughness, corresponding to a distance between a highest point and a lowest point on a  
3 surface of the electron-emitting material, ~~[[being]]~~ which is less than 10 microns.

1           67. (Previously Presented) The cathode of claim 63, said layer of electron-emitting  
2 material having a thickness in a range of 30 microns to 80 microns.

1           68. (Previously Presented) A cathode, comprising:  
2 a metal base;  
3 a layer of electron-emitting material including an electron-emitting barium-based  
4 alkali-earth metal carbonate material disposed upon said base; and  
5 a needle-shaped electrically conductive material providing electrically conductive  
6 paths in said layer of electron-emitting material;  
7 said conductive material having a specific resistance not greater than  $10^{-1}$  ohms  
8 centimeter.

1           69. (Previously Presented) The cathode of claim 68, further comprising a metal layer  
2 having a grain size smaller than a grain size of said metal base, and interposed between said  
3 metal base and said layer of electron-emitting material.

1           70. (Previously Presented) The cathode of claim 68, said conductive material



2 comprising 0.01% by weight to 30% by weight of said metal layer.

Claim 71. (Canceled)

1 72. (Previously Presented) A cathode, comprising:  
2 a metal base; and  
3 a layer formed on said base from a carbonate paste comprising a barium-based  
4 carbonate electron-emitter and a needle-shaped electrically conductive powder;  
5 said needle-shaped electrically conductive powder having a specific resistance not  
6 greater than  $10^{-1}$  ohms centimeter.

1 73. (Previously Presented) The cathode of claim 72, further comprising a metal layer  
2 having a grain size smaller than a grain size of said metal base and interposed between said  
3 metal base and said layer.

1 74. (Previously Presented) The cathode of claim 72, said needle-shaped electrically  
2 conductive powder comprising 0.01% by weight to 30% by weight of said layer.

Claim 75. (Canceled)

1 76. (Currently Amended) The cathode of claim 72, said layer having a surface

- 2 roughness<sub>1</sub> corresponding to a distance between a highest point and a lowest point on a  
3 surface of the layer<sub>1</sub> ~~[[being]]~~ which is less than 10 microns.

Claims 77-79. (Canceled)